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ESSAY

ON

TUBERCLES.

BY

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Si les cadavres nous ont quelquefois paru muets, c'est que nous
ignorions l'art de les interroger.

BROUSSAIS.

EDINBURGH:

M.DCCC.XXXII.

W. Garding.

With the author's compliments.

ESSAY ON TUBERCLES.

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IN the whole range of medical science, there is probably no subject which modern investigation has more strenuously sought to elucidate, than that which gives its title to this paper. Nor is this difficult to be explained. The fearful ravages of pulmonary consumption ; the insidious nature of its approach ; the rapacious cruelty with which, as if in bitter mockery of our hopes, it loves to select the young and the beautiful for its victims ; and the little avail hitherto attending our exertions, to wrest the prey from the merciless spoiler ;—all have combined to impart to its investigation, no ordinary share of interest. Nor have the difficulties attending the pursuit, caused the zeal of its followers to relax ; for obstacles in the path of the real votary of science, instead of paralyzing exertion, only lead to greater effort. It is a heartless apathy, equally unworthy of the man of benevolence and the man of science, which can look at the mass of disease yet unsubjected to the control of medicine, without humiliation at its extent, and anxiety for its diminution. And who shall say that its diminution, nay its final extinction, may not ultimately be accomplished ? There are depths in science and in medicine too, of which our present means of investigation, only serve to show the profundity ; but who will venture, either in the one case or in the other, to set bounds to the future advance-

ment of knowledge? With the recollection of what has been already done, is there any one in the whole range of diseases, against which the power of medicine shall be declared for ever unavailing? It must be obvious, however, to every reasonable inquirer, that a conquest so noble as that which we contemplate, is not to be attained at once. So desirable an object must be the result of patient and laborious investigations; of multiplied and varied experiments; of impartial and repeated observations. We must be content to ascend the steps, if we would ever attain the summit. It is on this account that every devoted student of medicine, must hail with pleasure the light which has been thrown, on this and kindred subjects, by the French school; to the writings of whose members, the following pages confess their obligations. And to those who have devoted their lives to an unflinching warfare with disease and death, and to the grateful task of soothing the pangs of suffering humanity, will be adjudged by every properly constituted mind, a higher meed of applause, than to heroes and conquerors the most successful and renowned.

In the prosecution of the design which is to occupy the following pages, a description of tubercles is obviously the first step. The term itself (the diminutive of *tuber*) is met with in the writings of Galen; in which, as well as in those of succeeding authors, it was made to comprehend small tumours of various descriptions, having little in common but their form. It is now, however, from the greater accuracy of medical nomenclature, applied only to a morbid production of a particular kind; and it is in this restricted sense that we are now to consider it. Its nature and seat have been studied by various observers, with great zeal and assiduity; but the widely discordant opinions they have expressed, both as to its origin and every step of its progress, establish at once the difficulty of the subject, and the necessity of farther research. With opinions so conflicting from observers so competent, I shall aim rather at forming a digest of their sentiments on the most prominent points, than of pronouncing with confidence on any. To deliberate, rather than to dogmatize, is the part of the impartial inquirer.

Bayle was the first who described the appearance and development of tubercles, with any thing approaching to accuracy; but to Laennec we are indebted for a still more lucid delineation. The most common form in which they invade the lungs, is that to which he gives the name of *miliary*. In this variety they resemble small grains, equalling or somewhat exceeding the size of a millet seed, rather less consistent than cartilage, usually grey and semitransparent, but sometimes wholly transparent, and destitute of colour. In this respect, however, they are found

to vary from contingent circumstances. Thus in jaundice, their surface acquires a yellow cast, especially when seated in the liver. If in the vicinity of gangrene, they acquire a dirty-brown stain. They are sometimes partially stained or spotted by the black pulmonary matter; to a slight admixture of which, Laennec thinks it probable they are indebted for the greyish colour, which distinguishes their first or semitransparent stage. He is confirmed in this opinion, by having observed that the transparency of these miliary granulations, is in the inverse ratio to the quantity of black pulmonary matter. This colouring is very distinct in the tubercles which are formed in the bronchial glands; where it has been compared to the shading of a crayon drawing, very deep in one part, and gradually becoming less so as it recedes from that point. With respect to shape, they appear round to the naked eye; but if examined with a lens, they are stated to present irregular angles.*

Thus far Laennec. But Andral denies that tubercles are transparent in their first stage; alleging that they have never been found to present that appearance, in any other parts of the system, occasionally the seat of tubercle. He asks why they are never seen transparent in the lymphatic ganglions, where tubercles can be followed in all the stages of their developement; or in the brain, the liver, the spleen, the submucous, subserous, or intermuscular cellular tissue. He refers, indeed, to one case related by Chomel,† where small globular bodies, resembling in consistence the crystalline lens, were found in the brain, lungs, liver, spleen, kidneys, and the phrenic portion of the peritoneum. He infers, however, from the description, that they differed essentially from the miliary tubercle of Laennec.‡ The last named author, although he does not bring forward any instance of transparent granulations in the lymphatic glands, remarks that the tubercles which form there, are observed to be surrounded by a semitransparent matter of a greyish tint, indicative of the approaching tubercular transformation of the gland. He refers to Bayle's 12th case, where the spleen was found filled with small greyish tubercles. He considers their developement in other organs as sufficiently confirming his opinion; alleging, that on the surface of the pleura or peritoneum, they are sometimes found either partially or wholly transparent, and either colourless or with a greyish tint. Sometimes they have an opaque yellow spot in the centre, while at

* Forbes's Laennec, 3d edition, p. 278, 281, and 282.

† Article Granulation, in the Dict. de Medecine.

‡ Anatomie Pathologique, translated by Townsend and West, Dublin, 1829. Vol. i. p. 509-10.

others they have become altogether tubercular; all these different stages being not unfrequently met with on the same membrane. The same appearances, he remarks, may be traced in the intestinal ulcers of phthisical subjects. Finally, he lays it down as a general rule, especially worthy of consideration, that, with the exception of melanosis, all the accidental productions which have no analogy with the natural textures of the body, are in their first stage hard and semitransparent. *

But Andral does not consider that any support can be gained, from the small grey bodies, which occasionally stud the surface of serous membranes. These he regards not as tubercles, but as rudiments of false membrane. The granules of a similar appearance, which mucous membranes sometimes present, he considers to be hypertrophied follicles. All these bodies, how different soever in nature and origin, are known by the generic term *granulation*; and in similar granulations, when they occur in the lungs, he allows that tubercular matter is often deposited, because he regards them as the product of partial pneumonia; the irritation attending which, he considers very favourable to the secretion of tubercle. What Laennec, therefore, regards as the first stage of tubercles, Andral considers as only the nidus for their formation. † He further objects, that these granulations are very frequently developed in the inferior lobes of the lung; and, therefore, if Laennec's opinion were correct, we might expect to find tuberculous excavations towards the base of the lungs, more frequently than they are known to occur. ‡ Bayle considered that they differed essentially from tubercles, and were of a cartilaginous nature; § on which Laennec remarks, that if this were true, they would sometimes become ossified. || Chomel does not contend for their cartilaginous structure; but considers that the fact of their never coalescing, sufficiently proves their non-identity with tubercles. ¶

On the other hand, Laennec has for his partisan a writer of greater authority on these subjects, than either of his opponents. M. Louis has investigated, with his accustomed assiduity, this as well as every other point connected with the subject; and adduces several reasons for giving his suffrage to Laennec. He has found the granulations in question, as in the case of tubercles of a less disputed character, more numerous towards the summit than the base of the lungs; and when confined to one

* Forbes's Laennec, 3d edition, p. 280 and 281.

† Anatomie Pathologique, (translation,) 1829, Vol. i. p. 510 and 511.

‡ Clinique Medicale, 2me edit. Tome ii. p. 5.

§ Recherches sur la Phthisie, Paris, 1810, p. 48.

|| Forbes's Laennec, 3d edition, p. 280.

¶ Chomel, in the 10th Volume of the "Dictionnaire de Medecine," p. 345.

part, it was always the superior portion. Their state of advancement, too, was always in correspondence with their place in the lungs; so that, tracing them from below upwards, they were found to be first grey and semitransparent, then with a yellow spot in their centre, and at last wholly transformed into a yellowish-white coloured matter,—in fact, into crude tubercles. Granulations and tubercles generally accompanied each other. In the lungs of two patients only, were the latter found without the former, and only five times were the former observed without the latter; and even in some of these the central transformation had commenced. “These facts,” he concludes, “appear to establish incontestibly the conversion of grey semitransparent granulations into tubercular matter.”

Sometimes, as in his twenty-ninth case, the grey matter showed itself in another form; that of irregular masses, varying in size from one to three cubic inches, having in the midst a great number of yellowish-white points. In other cases, again, the grey matter was almost wholly replaced by tubercular masses, only a few remnants of the former being left. Again, he considers, in direct opposition to Andral, that evidence of the fact in dispute may be obtained, though more rarely, from other organs; in proof of which he advances his seventh case, where a tubercular mass, into which four-fifths of the great omentum and mesocolon were converted, inclosed several portions of semitransparent grey matter. “Is it not probable,” he asks, “that the latter would sooner or later have undergone the tubercular transformation?” Tubercular excavations of any considerable size, he almost always found surrounded by a certain quantity of this grey matter; and an instance of its very singular mode of disposition, is given in his forty-sixth case; where it formed three parallel horizontal zones, an inch in height, separated by portions of slightly engorged lung of equal dimensions. Whitish or yellowish spots, in very great quantity, were disseminated through these zones, sufficiently indicating their commencing transformation; so that, whether appearing under the form of individual granulations, or of irregular masses, the grey matter sooner or later becomes tubercular.

The rapidity with which phthisis sometimes runs its course, might lead to the conclusion, that tubercles may occasionally be deposited in a crude state, without being preceded by the grey matter; and to this opinion some countenance appears to be given, by the case of a young girl; in whom, on the 35th day of the disease, he found a very large quantity of softened tubercular matter, part having already been expelled. Nevertheless, in the same lung, grey matter existed; and in other cases, also very rapid in progress, grey matter was found in

the centre of a tuberculous mass. This was observed in his thirty-sixth case, where the disease terminated fatally on the 48th day; and where the superior lobe of the left lung, was almost wholly converted into a softened tubercular mass, inclosing several portions of grey matter. This might certainly have been developed after the former; but the reverse seems more probable. Louis, however, goes so far as to admit, that tubercles might sometimes be primarily deposited in the lungs in a crude state; since, with only two exceptions, that is, the form in which they have appeared to him to be developed in other organs.*

On the subject of these disputed granulations, Andral gives a summary of the prevalent opinions. Some follow Bayle's hypothesis, that they are an accidental production *sui generis*; others, with Laennec, consider them as only the first stage of tubercles; while a third party follows Morton, Portal, and Broussais, in looking upon them as lymphatic glands in a state of enlargement. A fourth opinion is that entertained by Andral himself; who, though at one time disposed to consider them as lymphatic glands, has been led by further examination to abandon that opinion. He avers that these bodies, though now white or grey, and of a cartilaginous firmness, were at first red and soft; and, by examining these, he is led to the conclusion, that they are engorged air-cells; which, on being cut, retain their spherical shape, and give the appearance of granulations, while the surrounding healthy cells collapse.†

Andral also denies that tubercular matter, on its first appearance, has the consistence attributed to it by Laennec; but compares it to a drop of pus, easily removed by the back of the scalpel. The fluid parts being absorbed, it gradually acquires consistence, he says, by a kind of crystallization. Indeed, he expressly declares his opinion in another place, that tubercular matter is to be considered a particular kind of pus; alleging, that he has more than once seen the *pia mater* infiltrated with purulent matter, which gradually changed its appearance, assumed a more solid form, and became tubercular. To this mode of formation he attributes the roundish form of a tubercle; observing, that every secreted liquid, if pressed equally on all sides, will necessarily assume that appearance, as is generally seen in abscesses.‡

In his more recent work, however, (the *Anatomic Pathologique*,) he appears to have somewhat modified this opinion. He is there referring to the researches of M. Cruveilhier; who,

* *Recherches Anatomico-Pathologiques sur la Phthisie*, Paris, 1825, p. 2 to 7.

† *Clinique Medicale*, 2me edit. Tome ii. p. 6 to 12.

‡ *Ibid.* p. 2, 12, 13, 16, and 17.

on examining the bodies of various animals, found among hard white tubercles other bodies, differing from them only in being fluid; whence he concluded that the latter were only tubercles in their first stage, and that, in fact, the origin of tubercles is always puriform. Some confirmation appears to have been lent to this opinion, by the experiments of Trousseau and Leblanc, who found in the lungs of horses well-formed tubercles, intermixed with purulent points. But Andral, with true philosophic caution, draws a distinction between what is constant and what is accidental; and, while admitting the probability that tubercle may be fluid at the moment of its deposition, considers it, nevertheless, as not sufficiently established. He cautions the reader not to suppose, that every product of secretion must of necessity be primarily fluid; for the cuticle, among others, never appears but in the solid state; and it is certain, that, whatever be their origin, and however small their size, that is the form in which tubercles are observed.*

The fluid origin of tubercles is likewise advocated by Dr Baron of Gloucester; but with this addition, that the simple vesicle, in which they are stated to take their rise, he considers to be a hydatid. This hydatid he conceives to be the fruitful parent of tumours, in all their frightful variety, only modified according to the region where they appear, and the constitution attacked.† But this theory will hardly bear examination. Dr Abercrombie made various experiments on the subject; from which it results, that tubercular matter differs essentially from the contents of a hydatid; the former being found to yield a very great proportion of its weight of albumen; while the latter consists of water, with a trace of salts, and a little muco-extractive.‡ But the account which Dr Baron gives of the further progress of his hydatid, is sufficient to seal its fate. Reversing the order described by Laennec, he considers that a process of gradual inspissation takes place, without any subsequent softening. A moderate acquaintance with the actual morbid appearances, is sufficient on this point to secure us against error. “Dr Baron,” it has been remarked, “has betrayed not only a singular misapprehension of the pathology of the diseases of which he treats, but actually not a due acquaintance with the natural history of hydatids themselves, on which all his opinions repose. He reproaches Laennec with indulging in unnecessary

* Townsend and West's Translation of Andral's *Anatomie Pathologique*, Dublin, 1829, Vol. i. p. 511-12.

† Enquiry illustrating the nature of Tuberculated Accretions, 1819; and Illustrations of the Enquiry, &c. 1822.

‡ Edinburgh Med. Chir. Trans., Vol. i. p. 682, &c.

minuteness in his description of tubercles ; forgetting, in his zeal for the hydatid doctrine of disease, that Nature's forms may be very diversified, and that it is the privilege of theory only to be just as simple as the theorist could desire." * Hydatids, it would appear, are far from being sufficiently common for the Doctor's purpose ; for out of 6000 subjects, Andral met with only five cases.† In the lower animals, however, their appearance is much less rare ; and their not unfrequent co-existence with tubercles seems to have led Dupuy to the conclusion, that they necessarily precede them ; and are, in fact, as Dr Baron has suggested, only tubercles in the first stage. M. Dupuy's situation, as Professor at the Veterinary College, Alfort, has furnished him with numerous opportunities of prosecuting the subject ; and in various of the Ruminantia, especially the cow, he has frequently found hydatids, surrounded by a layer of tubercular matter, which he conceives to have been formed by the cyst of the hydatid.‡ The same appearances have been observed by Andral in the lungs of phthisical horses ;§ and in one case also in a rabbit, the liver of which was thickly sown with hydatids in different states ; some perfect ; others surrounded with a layer of matter analogous to tubercle ; and others again presenting only gelatinous fragments, in the midst of tubercular matter, which had gradually usurped their place. || In the disease to which swine are liable, called *measles*, serous cysts and tubercles are usually found together ; the former being often more numerous than the latter.¶ But in all this he sees nothing, but the somewhat varying products of a morbid secretion. ** And, certainly, from their accidental complication, we are hardly warranted to infer the necessary dependence of the one on the other. Were that the case, we might surely expect to find them more frequently in company ; whereas, in all his extensive experience, Andral has found them only once co-existent in the human subject.†† The fact previously mentioned, of a hydatid being sometimes surrounded with a zone of tubercular matter, is nothing more than what takes place in the case of other foreign bodies. Many of my readers will have seen globules of mercury, a few days after injection into the *bronchia* of a rabbit, furnished with a coating of matter, in every respect analogous to a crude tu-

* Dr Mason Good's Study of Medicine, edited by Samuel Cooper, 3d edition, Vol. iii. p. 260.

† Clinique Medicale, 2me edition, Tome ii. p. 406.

‡ Dupuy's Traité de l'Affection Tuberculeuse.

§ Anat. Pathol. (translat.) Dublin, 1829, Vol. i. p. 507.

|| Clinique Medicale, 2me edition, Tome ii. p. 25.

¶ Anat. Pathol., (transl.) Dublin, 1829, Vol. i. p. 509.

** Clinique Medicale, 2me edit. Vol. ii. p. 26.

†† Anat. Pathol. (translat.) Dublin, 1829, Vol. i. p. 507.

bercle. In the case of hydatids themselves, they are sometimes surrounded by other matters ; for Andral has seen them in the midst of blood, and pus, and liquids of various kinds, and sometimes the hydatid only existed in the form of debris*. It will not be contended that a deposition of blood or pus, is always preceded by a hydatid. Even granting that the cyst of the latter might occasionally secrete a substance, in its physical characters more or less resembling tubercle, that is far from proving that the existence of a tubercle necessarily presupposes a serous sac. Matter resembling tubercle, has occasionally been found in lymphatics and in mucous follicles ; but neither of these will be insisted on as indispensable requisites.†

Having thus canvassed, at some length, the several opinions maintained by different pathologists of eminence, as to the first stage of tubercles, let us now follow their progress a step farther. The first indication of their quitting the miliary state, is the appearance of an opaque yellow spot in their centre, as described by Laennec‡ and Louis ; § or, as Andral contends may occasionally happen, on the surface. || This speck gradually increases, till it involves the whole tubercle ; which then constitutes a yellowish-white soft mass, and is called *crude*. During this time, however, the tubercles have increased in size, and the contiguous ones coalesce. A single tubercle may acquire a size varying from that of a cherry-stone to that of an almond ; but the union of several tubercles will produce masses of much greater magnitude ¶. But the growth of tubercles is another subject of dispute. Laennec says they grow by intus-susception ;** but Andral very properly remarks, that this could only be the case with an organized living body. They must therefore grow or increase in bulk, like other inorganic substances, by accretion or juxtaposition. The same cause which led to their being deposited at first, equally leads to their subsequent augmentation. ††

Having arrived at the second or crude stage, they may remain stationary for a very indeterminate period. Laennec states it to be very variable ‡‡. According to Broussais, they.

* Clinique Medicale, 2me edit. Vol. ii. p. 26.

† Anat. Pathol. (transl.) Dublin, 1829, Vol. i. p. 508.

‡ Forbes's Laennec, 3d edition, p. 278 and 279.

§ Recherches sur la Phthisie, Paris, 1825, p. 3.

|| Clinique Medicale, deuxième edition, Tome ii. p. 5 and 6.

¶ Forbes's Laennec, 3d edition, p. 278 and 279.

** Ibid.

†† Anat. Pathol. (transl.) Dublin, 1829, Vol. i. p. 514.

‡‡ Forbes's Laennec, 3d edition, p. 283.

may remain for a long while unchanged.* Louis places the commencement of the next, or third stage, at an interval sometimes of from 20 to 40 days from the invasion of the disease, but generally much more protracted.† Andral states that it varies from a few weeks to many years.‡ He also raises an interesting question, as to whether absorption can take place in this the erude state. Though compelled to leave this question undecided, yet he has sometimes met with tubercles of so singular a form, as to lead to the suspicion of their having sustained a partial absorption.§

Independently of absorption, there are two changes which crude tubercles may undergo. The first is the *cretaceous* transformation; which appears to consist in the substitution of the salts of lime, for the greater part of the animal matter, of which tubercles, in their erude stage, are chiefly composed. This will be seen from the following analysis of M. Thenard. In 100 parts of *crude* tubercle, he found 98 of animal matter; while the rest consisted of phosphate and carbonate of lime, muriate of soda, and oxide of iron. But in *cretaceous* tubercles the proportions were reversed. This change is considered to take place when tubercles, long remaining in the chronic state, have produced a kind of endurance in the system; so that the symptoms which announced their presence, have gradually ceased to be urgent.|| It does not appear improbable that this might have been the morbid alteration, elevated by Bayle to the rank of a separate disease, under the title of *Calculeus Phthisis*.

But by far the most frequent alteration is that of *softening*; which constitutes the third stage of tubercle. This change of consistence is not attributed by Andral, any more than its increase in bulk, to the tubercle itself. As in the case of other foreign bodies, a process of irritation is set up, secretion of purulent matter ensues; and this, intermixing with the tubercular matter, mechanically separates its particles, and produces what he calls the purulent transformation. To this rational explanation a difficulty presents itself, in the fact stated both by Laennec¶ and Louis**, that the process begins in the centre of the mass. Andral allows that "it certainly does so in a great many cases;

* Histoire des Phlegmasies, ou Inflammations, Chroniques, 4me edition, Tome i. p. 26.

† Recherches sur la Phthisie, Paris, 1825, p. 10.

‡ Anat. Pathol. (transl.) Dublin, 1829, Vol. i. p. 513.

§ Ibid. Vol. ii. Dublin, 1831, p. 549.

|| Ibid. Vol. i. Dublin, 1829, p. 516 and 517.

¶ Forbes's Laennec; 3d edition, p. 283.

** Recherches sur la Phthisie, Paris, 1825, p. 10.

but they *may* also begin to soften in other parts, and especially towards their surface;”* an explanation which takes little from the force of the objection.

But in what manner soever the softening may be effected, the matter in this state will present one of two appearances; either that of a thick inodorous yellow pus, or that of a fluid resembling whey, having suspended in it small portions of opaque matter, of a caseous consistence.† Finally, this matter finds its way into the bronchia and is expelled. This is effected, according to Andral, by the process of irritation continuing till, as in the case of any other foreign body, it leads to a solution of continuity, and the expulsion of the offending substance.‡ We have now what was once called an *ulcer* of the lungs, but latterly a *tuberculous excavation*. The latter name, in contradistinction to the former, was given to it by Laennec, from the supposition that no corrosion of the surrounding tissue takes place, but that it is merely pressed aside and condensed.§ But this view of the case is hardly compatible with the phenomena, observed in cavities of any considerable extent. Opening into these cavities will generally be found the mouths of bronchial tubes, which, as Laennec himself states, “are cut directly across in a line with the internal surface of the excavation; and their direction is such as shows them to have originally crossed this space.”|| Is not corrosion here sufficiently evident? Louis considers it plainly manifest, from various circumstances, that excavations cannot exist without the previous distinction, more or less considerable, of the pulmonary substance.¶ Andral’s testimony on this point is still more decided. “The cavities,” he observes, “are not formed by the tissue of the lung being forced back and condensed; but the parenchyma is really destroyed, and a true ulcer formed, which goes on constantly increasing in size, until its dimensions far exceed those of the original tuberculous mass.”** But, however this controversy may be decided, *tuberculous excavation* will still be a convenient term, both as indicating its origin, and distinguishing it from an ulcer, the result of pneumonia.

The time of the complete excavation of these cavities, is stated by Louis at not less than three months from the commence-

* Anat. Pathol. (Transl.) Vol. i. Dublin, 1829, p. 516 and 517.

† Forbes’s Laennec, 3d edition, p. 283. Andral’s Anatomie Pathologique, (transl.) Vol. ii. Dublin, 1831, p. 545.

‡ Anat. Pathol. (transl.) Vol. i. Dublin, 1829, p. 515.

§ Dr Stokes on the Stethoscope. Edin. 1825, p. 94.

|| Forbes’s Laennec, 3d edition, p. 235.

¶ Recherches sur la Phthisie, Paris, 1825, p. 12.

** Anat. Pathol. (transl.) Vol. ii. Dublin, 1831, p. 546.

ment of the disease. The walls then become lined with a false membrane of very slight consistence, replaced after a time by another of a less friable nature, gradually acquiring, as is stated by Louis, a semicartilaginous hardness. Bayle considered that pus was secreted by this false membrane; but Laennec found that excavations so lined were generally empty. Sometimes, as in a fourth part of Louis's cases, no membrane exists at all; and then the naked pulmonary tissue, condensed, red, and infiltrated, formed the walls of the excavation.*

Tuberculous excavations are often traversed by bands, which, from their being more slender in the middle than at the extremities, have been compared to the *columnæ carneæ* of the heart. They consist of condensed pulmonary tissue, and were considered by Bayle and others to be vessels; but Laennec states, that he has never found them enclosing a vessel of any consequence; and Louis has met with only five such instances.† This must be understood, however, as applying rather to their not existing as vessels at present, than to their never having had that form; for there seems good ground for believing, that, by an admirable arrangement, of which the animal economy presents to us so many instances, while the bronchial tubes are cut across, (thus allowing free exit for the morbid deposit,) the blood-vessels, where a similar occurrence would produce fatal hæmoptysis, are insulated from the surrounding tissue, and becoming gradually obliterated, form the bands in question.‡

¶ The situation commonly chosen by these cavities, is the top of the lung; and, according to Louis and Stark, nearer the posterior than the anterior surface. The former of the two last named authors observes, that he has never met with great excavations in the centre of the inferior lobes. The situation which cavities are thus generally found to occupy, corresponds with that where the tubercles from which they spring, are observed to be first and most abundantly deposited; for all writers agree, that making the first invasion at the summit, every crop as it successively appears, takes a lower and lower position, till the whole lung is gradually pervaded. § Of all the cases de-

* Forbes's Laennec, 3d edition, p. 284 to 286. Louis's Recherches Anatomico-Pathologiques sur la Phthisie, Paris, 1825, p. 11 and 12. Bayle's Recherches, &c. Paris, 1810.

† Ibidem.

‡ A very interesting observation on this subject, I remember to have heard from Dr William Stokes of Dublin; to whose zealous and enlightened devotion to pathological researches, I am happy to have this opportunity of bearing my unfeigned testimony. The fact I allude to was this, that in the bands which traverse tuberculous excavations, vessels had been found not only pervious, but actually conveying blood to the parts beyond.

§ Dr Stark, in Medical Communications, Vol. i. 1784, p. 369. Louis's Recherches sur la Phthisie, Paris, 1825, p. 13. Forbes's Laennec, 3d edition, p. 288 and 289.

tailed by Louis, in his *Recherches sur la Phthisie*, the 33d is the only one, in which the developement of tubercles took place in an opposite manner; namely, from the base toward the summit. Broussais observes, in support of his particular views, that the portions of lungs where tubercles are most abundantly encountered, are precisely those most subject to bronchitis. *

A difference of opinion is to be observed among the best authors, as to the relative frequency of tubercles in the two lungs. Laennec declares for the right; though he allows it not unusual for the left to have the predominance. † But Louis, from the results of 123 cases, considers the left to be more exposed than the right. He found the upper lobe disorganized in thirty-eight instances; and in twenty-eight of these it was the left lung. Seven out of eight cases of perforation of the pleura, were on the left side; as were also five out of seven cases, in which tubercles were confined to one lung. ‡ A similar conclusion was arrived at, by Drs Stark and Carmichael Smyth. §

But an inquiry of much greater importance, because directly bearing on the question of the curability of phthisis, is whether the tuberculous cavities of which we have spoken, are capable of cicatrization. The affirmative of this question is maintained, both by Laennec and Andral. The former speaks of having frequently observed pulmonary cavities, with all the appearance of tubercular origin, but lined with a semi-cartilaginous membrane. This he considers to be an internal cicatrix, analogous to a fistula; and when perfect, to have but a very slightly injurious effect on the health. The patients in whose lungs these appearances were found, lived for years, subject only to slight dyspnoea and chronic catarrh; and died, either of a disease unconnected with phthisis, or of a tubercular developement, subsequent to that which had produced the cicatrices. "I have within these few years," he observes, "had under my care several patients affected with chronic catarrh; and who afforded distinctly the sign of pectoriloquism, although they had in no other respect any symptom of consumption." Had any other than Laennec been the auscultator, a suspicion might have been raised, that bronchophony from the dilatation of a bronchial tube (the result of chronic catarrh) had been mistaken for pectoriloquy. He also mentions a lady, declared by Bayle (fourteen years before,) to be decidedly consumptive, who recovered be-

* Histoire des Phlegmasies, 4me edition, T. ii. p. 213.

† Forbes's Laennec, 3d edition, p. 288 and 289.

‡ Recherches sur la Phthisie, Paris, 1825, p. 7. 8, and 9.

§ See Dr Stark, in the 1st Vol. of Medical Communications, 1784, and a note by Dr Forbes, in the 288th page of his Translation of Laennec, 3d edition.

yond all expectation ; retaining only a slight cough, while pectoriloquy was still "most distinct." All these he considers to have been instances, where tuberculous excavations were completely emptied, and acquired a cartilaginous lining. In further support of these views, he gives five cases, where dissection proved the state of the parts to be that just described. In the last of these, was observed an imperfect adhesion of the membrane lining the sides of the cavity ;—an appearance which led him to think, that the excavations might sometimes be wholly obliterated, without the intervention of a cartilaginous lining, by mere adhesion of the pulmonary substance, as in other solutions of continuity. He was confirmed in this opinion by sometimes finding, especially in the upper part of the lungs, bands of condensed cellular tissue, having every appearance of cicatrices. On the surface of the lung corresponding to these presumed cicatrices, he found a depression or retraction, like the puckering of the skin over a scirrhus mamma ; and evidently produced, as in that case, by the shrinking of the parts subjacent.*

The testimony of Andral is equally satisfactory. He regards it as a fact fully established, that the cicatrization of tuberculous cavities does actually take place, though unfortunately but in a small proportion of cases. Sometimes the cavity is filled up with a fibro-cartilaginous mass, and sometimes even with phosphate of lime. He notices also the depression or puckering of the external surface of the lung, described by Laennec ; adding, that this depression is filled up, either with packets of false membrane, or by an indentation of the thoracic parietes. He quotes several very striking cases of cicatrization, in support of his position.† We should be inclined to suspect, however, that they are not so frequent as Laennec imagined ; for Louis declares he has never met with these cicatrices ; and that superficial depressions are often found, where the tissue beneath is healthy.‡ While on a visit to Dublin, in the course of last year, I was shown by Dr Townsend a portion of lung, containing a condensed cellular band, which he considered a real cicatrix. Dr Townsend's familiar and extensive acquaintance with morbid appearances, entitles his opinions to much confidence.

Having now traced the progress of tubercles, as commonly met with, from their first appearance to their final evacuation, let us just notice two or three less ordinary forms, in which tubercular matter is sometimes developed.

* Forbes's Laennec, 3d edition, p. 395 to 315.

† Anat. Pathol. (Transl.) Vol. ii. Dublin, 1831, p. 546, to 549.—Clin. Med. 2me. edit. T. ii. p. 381 to 394.

‡ Recherches sur la Phthisie, Paris, 1825, p. 35 and 36.

The first is that of *encysted* tubercles;—a rare variety, since Louis has but once encountered it, as related in his 31st case.* The cyst is formed, according to Laennec, when the tubercles long remain stationary. A false membrane is deposited around them, gradually being converted into a soft cartilaginous cyst, smooth internally, but firmly united to the surrounding lung. The ossification of these cysts is extremely rare; but Laennec saw one osseous cyst, which appeared to have a tubercular origin.†

Hitherto we have spoken of tubercles as insulated bodies, gradually increasing in size, and coalescing into masses. But the morbid deposit may assume the latter form at once; and this constitutes what is called *tuberculous infiltration*, of which Laennec particularly describes two varieties. The first is the *grey* tuberculous, which is frequently met with in the neighbourhood of excavations. Sometimes, though very rarely, it exists alone. If cut, it presents a smooth polished section, of grey colour, and cartilaginous consistence; having nothing of the vesicular structure, and quite impermeable to air. Its first approach to softening, is indicated by the appearance of numerous opaque yellow spots in its interior; gradually involving the whole mass.

The other species is the *jelly-like* tuberculous infiltration. It is met with in the intervals of miliary tubercles, has a semi-fluid consistence, and is either colourless, or with a sanguineous tint. It gradually acquires greater consistency, and is insensibly transformed into the *grey* tuberculous infiltration just described; of which it may be regarded as a variety. Yellow spots make their appearance, and it runs through all the stages of tubercular degeneration.‡

We have now traced the progress of tubercles in the various forms they assume. It only remains for us to say a word or two on their origin. And here we shall not attempt to go through a fatiguing journey of centuries, to collect the crude and scattered opinions, which have at times prevailed on the subject;—such as their originating in putrid bile or phlegm, as maintained by Hippocrates; or from viscidty and obstruction of the pulmonary exhalent vessels, as held by Dr Reid and others; or from inorganic mucus, as contended by Dr Rush. In the present day the subject has nearly reduced itself to the question, whether tubercles are or are not the product of inflammation. To this question a decided negative is returned by Bayle, Laennec,

* Recherches sur la Phthisie, Paris, 1825, p. 10 and 398.

† Forbes's Laennec, 3d edition, p. 286.

‡ Ibid. p. 304 and 305.

Louis, &c. The various inflammatory lesions to which they might be assigned, are gone over at some length by Laennec ; who endeavours to prove, that with respect to neither of them is a sufficient case made out. With regard to pneumonia, which has been most relied on, he affirms that its symptoms rarely precede those of phthisis ; and that even where such a sequence is observed, it is impossible to say whether the tubercles by their irritation, may not have excited the pneumonia ; that in persons dying of the latter, the former are rarely found ; and that few consumptive patients present symptoms of pneumonia during life, or any trace of it after death ; that where the rare complication does exist, in 19 cases out of 20, the tubercles preceded the pneumonia ; that we have never been able to perceive the stages of transition from one to the other ; and that, although chemical analysis may not have discovered a difference, between softened tubercle and true pus, yet it has equally failed to point out the distinction, between the albumen of an egg and the secretion of certain cancers ; a fact which proves the imperfection of chemistry, rather than the identity of the matters in question.*

The grounds on which Louis advocates the same doctrine are, that of 80 phthisical subjects, into whose previous history he had particularly inquired, only seven had ever been affected with pneumonia, and only 23 particularly subject to catarrh ; that tubercles are more frequent in the upper lobes, while pneumonia commonly attacks the lower ; that the latter rarely attacks both lungs, while the former generally does so ; and that while phthisis is most common in women, men are more liable to pneumonia and catarrh. In cases of chronic pleurisy, he found as many tubercles in the lung of the sound, as in that of the diseased side. †

Dr Armstrong leans to the same side of the question ; observing, that, from the irritation produced by the increasing size and number of tubercles, a *consequent* surrounding inflammation is not unfrequently produced ; and that in many cases of tubercular depositions on the *pleura* or *peritoneum* the serous membrane is transparent up to those very points, and only becomes inflamed from the irritation consequent on their enlargement. ‡

But, on the other hand, the inflammatory origin of tubercles is maintained by several physicians of eminence and celebrity. As the most strenuous of these, the name of Broussais will instantly suggest itself. He considers tubercles to be lymphatic glands, rendered visible by inflammation ; and proposes to sub-

* Forbes's Laennec, 3d edition, p. 296 to 298.

† Recherches sur la Phthisie, Paris, 1825, p. 503 to 526

‡ Morbid Anatomy of the Bowels, London, 1828, p. 16 and 17.

stitute for *phthisis* the term *chronic pneumonia*. * On this it is remarked by Andral, who appears to take a middle course, that tubercles are probably inflamed lymphatic glands, in a certain number of cases; but that this is far from being their only source, as is proved by their developement in other parts of the system. "It is probable," he observes in another place, "but not demonstrated, that the pulmonary lymphatic ganglions are occasionally the seat of tubercles."† Tubercles, he concludes, are the product of a morbid secretion, generally, but not necessarily, preceded by active *hyperæmia*; for they may be the result, neither of an *increase* nor a *diminution* of the vital action, but of its *perversion*. In all this, however, he contends for the pre-existence of a tubercular diathesis. If the disposition to tubercles be very strong, the slightest local congestion, he conceives, will give rise to them. If less strong, positive inflammation is necessary. But if such a predisposition be wholly absent, inflammation, the most intense and long-continued, will fail of effect.

The subject has been ably investigated by Dr Alison, whose remarks will be found at large in the first and third volumes of the Edinburgh Med.-Chir. Transactions. I shall only advert to the conclusion arrived at. Dr Alison "has little doubt that tubercles do often form, without being preceded by inflammation, of such a character as to be detected by symptoms during life; and that, in the lungs at least, the inflammation, of which the undeniable marks are so often found along with them after death, has really often been posterior to them in date. But he has also been led to believe, that it is not merely (as Laennec states) a possibility, but a real and frequent occurrence, that inflammation, acute or chronic, (to which he would add febrile action) however produced, becomes in certain constitutions the occasion of the developement of tubercles."

When doctors so distinguished disagree, it is not for me to decide; but in this, as in other cases, it will be probably found, that truth is to be arrived at by avoiding extremes. We should probably err, and in our present state of knowledge, we should certainly not be justified, in attributing them exclusively either to one cause or to another. The whole course of our investigations, indeed, must suffice to convince us, on how limited a number of points a decided opinion is admissible. To what side soever we turn, we meet with doubts unresolved, difficulties unsurmounted, intricacies unexplored. Points we had considered to be clearly established, will often fail to stand the test of closer examination;

* Histoire des Phlegmasies, 4me edition, T. ii. p. 25 and 385, et T. i. p. 72.

† Clin. Med. 2me edit. T. ii. p. 18, 24, 25, 26, and 28.

and ground we had esteemed the most solid and secure, will sometimes tremble beneath a determined step. Such a review as we have taken, is calculated to leave on the mind a most salutary impression ; for where ignorance is confident, and arrogance bold, it is the part of true philosophy to doubt and to deliberate. But this review will have failed of a most important part of its intended effect, if, along with this sense of deficiency, it do not produce at the same time, the most strenuous anxiety to supply it. Obstacles, instead of lulling, should arouse the spirit of exertion. If there were no difficulties to overcome, there would be no merit in the attempt. It would but paralyze our efforts, were we to conceive that all has been effected which is capable of being achieved ; but the more that has been left undone by our predecessors, the more is there left for their successors to accomplish. The mine is still rich, and the means of exploring it are at hand. 'The field is great ; the path is open ; the pursuit is noble ; and rich and varied are the results, that will reward the diligent investigator. Far as we think ourselves to have advanced, we may yet be only at the commencement. The wisest philosophers of the present day are those who confess their ignorance ; for our present knowledge is calculated rather to make us ashamed of our deficiencies, than vain of our acquirements. We have heard much of the "*decline of science in England*," I would rather speak of its *limited advancement everywhere*. Endeavour, in any direction, to trace effects to their causes, and how soon is your progress arrested. With the great final cause of all the phenomena around us we are well acquainted ; but the secondary, the efficient cause, generally eludes our grasp. We have busied ourselves with the surface, but have failed to penetrate the interior. We have attentively examined the operations of nature's stupendous machinery, but of its intimate structure we know little. In fine, to adopt the language of the most enlightened, but yet most modest of philosophers : " We have been picking up pebbles on the sea-shore ; while the great ocean of truth lies before us unexplored."

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